

REMARKS

Claims 1-9 are pending. Claims 1-7 are allowable. Claim 3 is objected to. Claims 7 and 8 are rejected over the prior art. Claims 3, 7 and 9 have been amended. Reconsideration of this application is respectfully requested.

Claim 3 is objected to because claim 3 depends upon claims 1 and 2.

In response to this objection, the reference to claim 1 is deleted from claim 3, as suggested by the Examiner.

The cerium based composite oxide claimed in claim 3 is a mixture of the primary particles of claim 1 and the secondary particles of claim 2, and has particular properties as defined in claim 3. The secondary particles of claim 2 are, in turn, aggregates of the primary particles of claim 1.

Claim 7 has been amended to correct an obvious error, since this claim originally depends from itself. It is apparent that claim 7 should depend from claim 6 directed to the green compact.

Claim 9 is amended to depend from allowed claim 6 by incorporating the subject matter of allowed method claim 4 and claim 6. That is, the sintered product to be obtained by the method of claim 9 is prepared by sintering a green compact of claim 6, which is prepared by molding by pressing the composite oxide of claim 3, which is in turn prepared by the method of claim 4. Accordingly, the entire procedural steps are now recited in claim 9. Since claims 4 and 6 are allowed, it is believed that amended claim 9 should also be allowed.

Claims 8 and 9 are rejected under 35 U.S.C. 102(a or e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Cutler, et al (U.S. 6,770,392).

Claims 8 and 9 are also rejected under 35 U.S.C 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Japanese document 11—273451. These grounds for rejection are not believed to be well taken and are respectfully traversed.

The sintered product claimed in claim 8 is prepared by sintering the green compact of the composite oxide of claim 3, and characterized by the properties that:

- (1) the relative sintering density is not lower than 99%, and

(2) the average grain size of the primary grains therein is 0.8 to 3.0 μm .

The sintered product of the present invention fulfills both the high relative sintering density and the small average grain size at the same time. Contrary to the present invention, in general, when ceramics are sintered at a high temperature, the density is increased while the grains grow. This general tendency is clearly observed in both Cutler and the Japanese document.

In the Japanese document, sintered products having compositions comparable to those of the present invention are disclosed in Table 1. The average grain size and the actual density of the sintered products are described in Table 1, and the relative sintering density may be calculated from the theoretical (calculated) density of a corresponding product having the same composition described in Table 2 of the present application (page 24).

The sintered products of Comparative Examples 2 and 3 (Table 1) of the Japanese document have a composition $(\text{CeO}_2)_{0.8}(\text{SmO}_{1.5})_{0.2}$, which corresponds to Examples 23 to 28 of the present application (Table 2). The sintered product of Comparative Example 2, sintered at 1500 °C, has average grain size of 2.86 μm , which is within the claimed range, but the relative sintering density is only 96.1 %, which is outside the claimed range. This relative sintering density is calculated from the actual density of 6.84 g/cm^3 shown in Table 1, which is 96.1 % of the theoretical density of 7.117 g/cm^3 shown in Table 2 of the present application. Similarly, the sintered product of Comparative Example 3, sintered at 1600 °C, has an increased relative sintering density of 98.6 %, which is closer but still outside the claimed range, but the average grain size is as large as 5.42 μm , which is also outside the claimed range.

Similarly, the sintered products of Comparative Examples 5 and 6 (Table 1) of the Japanese document have a composition $(\text{CeO}_2)_{0.8}(\text{GdO}_{1.5})_{0.2}$, which corresponds to Examples 11 to 16 of the present application (Table 2). The sintered product of Comparative Example 5, sintered at 1500 °C, has average grain size of 1.79 μm , which is within the claimed range, but the relative sintering density is only 93.5 % (the theoretical: 7.258 g/cm^3) which is outside the claimed range. The sintered product of Comparative

Comparative Example 6, sintered at 1600 °C, has an increased relative sintering density of 95.5 %, which is higher than that of Comparative Example 5 but outside the claimed range, and the average grain size is as large as 4.36 μm , which is also outside the claimed range.

It is understood from these Comparative Examples of the Japanese document that, when the average grain size is within the claimed range, the relative sintering density is not sufficiently high, and when the relative sintering density is increased by sintering at a higher temperature, the average grain size becomes too large. Thus, the sintered products disclosed in this document cannot fulfill both the high relative sintering density and the small average grain size at the same time, contrary to the present invention, and thus the claimed average grain size of 0.8 to 3.0 μm cannot be achieved. This tendency is also observed from Fig. 2 of this document, which shows that the higher sintering temperature results in larger average grain size.

On the other hand, Cutler discloses the relative density of greater than 99 % in column 7, lines 34—35 (Examples 3—5), but the average grain size is not disclosed. However, since the sintering temperature is 1550 °C which is comparable to the temperatures in the above Comparative Examples of the Japanese document, and the sintered product is produced by a method that is similar to the one in the Japanese document but different from the present invention, it is reasonable enough to conceive that the sintered product having the relative density of greater than 99 % has an average grain size larger than the claimed range.

The method for producing the sintered product, particularly, the method for producing the composite oxide, which is sintered into the sintered product, is discussed below.

The high relative sintering density and the small average grain size of the present invention are mainly the result of the production process, i.e. precipitation of a composite salt from a slurry, calcining the resulting precipitate to obtain a composite oxide, and sintering the composite oxide. The method for preparing the composite oxide, including the precipitation step, as defined in claim 4 has been indicated to be allowable by the Examiner.

Contrary to the precipitation method of the present invention, the sintered products disclosed in Cutler and the Japanese document are both prepared by solid-state reaction. In Cutler the method for producing the sintered product is described, for example, in column 5, lines 22 to 47, and in column 6, lines 47 to 67. In the Japanese document, the method is described, for example, in paragraphs [0026] to [0033].

The solid—state reaction includes no precipitation of a composite salt, and the starting metal—containing materials are simply mixed by, for example, milling, and directly sintered into a sintered product. Using such a solid-state reaction, a sintered product having the properties defined in present claim 8 cannot be obtained.

Since Cutler does not even suggest the production method of the present invention, it is reasonably deduced that the average grain size of the sintered product disclosed in Cutler cannot be within the claimed range, according to the general tendency of higher density with larger grain size, as mentioned above.

Therefore, the present invention as defined in claim 8 is not anticipated by or even obvious over neither of Cutler or the Japanese document, and the present grounds for rejection of claim 8 should be withdrawn.

In view of the above arguments and amendment, the pending application is believed to be in condition for allowance and such action is earnestly solicited.

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